



The Impact of Drought on North Carolina Communities

Overview

In this lesson, students will examine how their city supplies water to residents, as well as evaluate water usage in their homes. Students will then examine North Carolina's drought, its impact on our state, and the conservation choices that can be made to alleviate critical water shortages. Assuming the roles of city council members, students will apply what they have learned to devise a local plan for water conservation.

Course

Civics and Economics; Biology; Earth and Environmental Science

North Carolina Standard Course of Study for Civics & Economics

- Objective 3.02: Explain how the North Carolina Constitution and local charters define the framework, organization, and structure of government at the state and local level.
- Objective 3.09: Describe the services provided by state and local government agencies and how funding is provided.
- Objective 9.04: Assess how current events impact decisions made by consumers, producers, and government policy makers.
- Objective 9.08: Analyze the influence of environmental factors, economic conditions, and policy decisions on individual economic activities.

North Carolina Standard Course of Study for Biology

- Objective 5.03: Assess human population and its impact on local ecosystems and global environments:

North Carolina Standard Course of Study for Earth and Environmental Science

- Objective 1.06: Identify and evaluate a range of possible solutions to earth and environmental issues at the local, national, and global level
- Objective 2.06: Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives.
- Objective 4.04 Evaluate water resources.

Essential Questions

- Why is water important?
- Where does your city's drinking water come from?
- How does treated water get to each of our homes?
- What are the various ways residences and businesses use water?
- In what ways is water sometimes wasted?
- What is a drought and what impact does it have on our community? Our economy?
- How can we work to conserve water and why is conservation important?

Materials

- "How Much Water Does My Family Use," handout attached
- Article, "Drought hammering NC farmers", available at <http://www.newsobserver.com/weather/drought/story/746039.html>
- Gallon jug outline, attached
- NC Drought Management Advisory Council: <http://www.ncdrought.org/>
- Article, "Duke Energy Faces Water Issues" (optional): http://www.newsobserver.com/print/tuesday/city_state/story/746074.html
- Tips for Preserving Our Water Supply, attached

Duration

2 class periods for completing all activities, though teachers can pull particular activities to complete due to time constraints

Procedure

Day 1

A Big “What If” with Water

1. As a warm-up, show the students a glass of ice water. Make the glass of water as appealing as possible then take a long sip in front of students. The teacher should make a big deal of how “wonderful” and “thirst quenching” the water is. Place the glass of water in front of the class and ask students to study it for a moment and to consider all of the different things we use water for. List student responses on the board. Ask students to discuss a simple question:
 - Why is water important?
2. Next, ask students where we get water from. List these responses on the board as well. As students offer answers from “rain” to “the faucet”, ensure they understand:
 - Water that comes through our faucets can come from two places - from the water in lakes or rivers (**surface water**), or from water that comes from wells (**groundwater**). Point out that people living in cities generally get their water from surface water, where as people living in more rural areas often get their water from wells.
 - Find out where your city’s water supply comes from; what percentage of the population gets their water from surface water (name these bodies of water)? Groundwater?
 - Focus on local government services for towns/cities by reminding students that municipalities provide water services by maintaining pipes that transport water to the **Public Utilities Department’s water treatment plant**. Here, water is filtered, cleaned, and treated, then distributed back through pipes to homes, schools, businesses, etc.
 - All of the water we use that goes down the drains (for flushing toilets, for washing dishes, etc.) also goes back through different pipes to the Public Utilities Department, which also manages the **sewer system**. The dirty water in the sewer system is directed to a **Wastewater Treatment Plant** and cleaned before being pumped back into a large body of water. This is why town residents have water and sewer charges on their water bill. Ask students:
 - Where does our city’s wastewater go after being treated?
 - How might our lives be different if our local government didn’t work so hard to make sure our water is clean, or that our sewage/waste water is removed from our homes and treated?
3. Tell students you want them to imagine for a moment that it never rained again. For dramatic effect, the teacher may choose to knock over the glass of water sitting in front of the class. Ask students to write creatively for 5-10 minutes on how our community would be affected if no rain fell ever again. Once students have finished, allow them to share their thoughts and discuss:
 - What would the immediate effects of a lack of rain be?
 - What would the long term effects of no rain be? on humans? On ecosystems?
 - How do you imagine our national government would respond? State government? Local governments?
 - How do you imagine communities would respond? How would individual citizens behave?

North Carolina’s Drought

4. Explain to students that while it may be unlikely that rain stops completely, we do experience extreme consequences from reduced rainfall. Tell students this is the situation North Carolina is in right now due to an ongoing **drought** (a period of long, dry weather). Ask students to share what they already know about North Carolina’s drought. If possible, project the map located at <http://www.ncdrought.org/>, or send students individually to the site, and discuss:
 - According to this map, what level of drought is our county currently experiencing?
 - How do you think our county and/or state got to this serious level of drought? (*Ensure that students think beyond the lack of rainfall our state has experienced and encourage them to consider the ways in which we use water.*)
 - What are the effects of a drought and what impact does it have on our communities? Who might a drought be hardest on and why?
5. Distribute a current events article to students that discusses NC’s drought situation, such as *Drought Hammering NC Farmers* (attached and available at <http://www.newsobserver.com/weather/drought/story/746039.html>.) Instruct students to read the article individually or in pairs and to answer the questions that follow.

6. Once students have finished, discuss the questions as a class and focus on the three areas most affected by drought: **economic**, **environmental**, and **social** (see <http://www.drought.unl.edu/risk/impacts.htm> for detailed impact in each area.) After discussing the various negative impacts, ask students to respond describing which impact they feel is most detrimental to our society and why.

Tracking Our Water Use

7. Redirect the class's attention to the list they created noting all the ways we use water. Discuss:
- First, of these uses, which are **wants** and which are **needs**? (*Review the difference in wants and needs, then assist students in differentiating the items on the list. For example, swimming is a "want", whereas drinking water is a "need".*)
 - What does it mean to waste water? What are some ways that we waste water? (*Assuming showering and brushing our teeth are classified as needs, discuss how we often waste water by showering for too long, or letting the water run continuously when we brush our teeth.*)
8. Next, ask students if they think they contribute to drought conditions in any way. Prompt them to guess how much water they think it takes to brush their teeth. Pull out a gallon of water, and explain that if they leave the water running while brushing their teeth, it generally uses up to two gallons! Refer back to the various activities from the list students created in the warm-up and have them estimate how much water each action takes.
9. Give students the "How Much Water Does My Family Use" tally sheet which notes the number of gallons used for common water activities (note that these numbers are an average.) Tell students that you want them to think about all the things they and their families do in a day that uses water. Explain to students that from the time they wake up until the time they go to sleep, you want them to track every time they and anyone in their household use water. Each time water use occurs, they should place a check on the appropriate row in Column B. At the end of the day, students will tally up the number of times each water activity occurred in Column C by adding up each row's check marks. Then, in Column E, students will tally the number of gallons used for each water activity by multiplying the numbers in Column C and D. Lastly, students will add up all of the numbers in Column E and write the total in the blank at the bottom of the page. Stress that it is important students answer honestly and that they remember this is a household tally sheet and not just their individual water use.

Note: Ideally students would complete this tracking activity on a weekend or holiday, so that they may note water use from morning till night.

Day 2

Conservation

10. Give each student a copy of the attached gallon image as they enter class. Have students write their total household gallons used in the middle of the gallon sheet and hang these around the room.
11. Have students report back on how water was being used in their homes. Then, instruct the class to add up each student's total household water use (hanging on the wall) to compile how many gallons the class used as a whole. Write this number on a large piece of paper and post it by the class's gallon images. Ask students to comment on how much water the entire class used (does it seem like a lot and why; not a lot and why; etc.) and whether they observed water being wasted, or wasted water themselves. Discuss:
- Did you are anyone in your household use water they didn't need, or use more water for any given activity than they needed? Explain.
 - Consider the impact of every family wasting several gallons of water a day. How might this affect a drought situation?
 - Is there anything we can do to help when we are experiencing a drought? (*Tell students that while they do not have the power to make it rain, they can help the situation with the drought by making the choice to **conserve** water.*) Consider the impact of every family that previously wasted several gallons of water a day conserving those same gallons. How might this affect our drought situation?
 - What are some specific ways we can conserve water?
 - What might the **consequences** be (present and future) if we don't change our behavior and waste less water?
 - Whose **responsibility** is it to manage our water supply and to encourage conservation?



12. As students consider the question of whose responsibility water conservation is, give them some background information on the general involvement of local governments:

- The **local government** of most of NC's towns and cities is responsible for devising a plan for water use, conservation, and fines for breaking restrictions. A **city or town council** generally has set stages that require monitoring the level of the city's water source (lake, reservoir, etc.) and what restrictions come into place when the level lowers significantly. As an area's water source continues to drop lower during drought conditions, restrictions become tighter. Local governing bodies also note fines that are to be imposed when citizens violate water restrictions. The cost of water is also often raised as scarcity ensues.
- While generally water usage is monitored and determined by local governments, under extreme conditions the **Governor** can step in. For example, in October of 2007 Governor Mike Easley called for NC residents to cut their water use in half (<http://www.newsobserver.com/1038/story/746196.html>). This is not only in response to current drought conditions, but also to the forecast that conditions will remain the same or worsen in the next year.
- Have students go to their local government's website to research which stage of **water restrictions** are in effect, or describe the restrictions currently in effect.

Discuss:

- Why do local governments impose water restrictions? Do you agree with this process? (*Encourage students to discuss whether they feel their local governing body has been proactive or reactive to NC's water shortage.*)
- Many local governments impose fines when a citizen breaks a water restriction. For example, someone caught breaking a restriction in Raleigh receives a \$200 fine on their first offense. Do you agree or disagree with such punishments and why?
- Some NC areas are in worse drought conditions than others, yet Governor Easley has asked all NC residents to conserve water and cut use in half. Do you agree that all residents should follow this guideline, even if your area is not in extreme drought at this time? Why or why not?

13. Break students into small groups and explain the following assignment:

You are a member of City Council and your city is currently experiencing extreme drought. As a Council, you have decided to revisit your municipality's water usage policy. As a group, devise a three stage plan for water usage. Each stage should describe residential restrictions, commercial restrictions, and industrial restrictions for water usage and an enforcement plan (i.e. fines, penalties, fee raises, etc.)

Once you have devised your plan, also consider how you will inform the citizenry of the current water conditions and revised usage plan.

Be prepared to present your work to class in 15-20 minutes.

Once students have completed their work, allow them to present their plans to class and question each other on the decisions they made. Further discuss:

- Of the plans today, which do you think would be most successful and why? Which would be met with citizen disapproval and why? Which plans would you consider too strict or too lenient and why?
- Do you feel the Governor of NC should exercise his **emergency powers** and place statewide restrictions on water use? Why or why not?
- In your opinion, at what point does a citizen need to be mindful of the water they use and why? (*Point out to students how we assume water will always gush out of our faucets, and that we often take for granted to process required for bringing that clean water to our homes. Remind students of their creative writing assignment on day 1 of the lesson.*) Is the safer bet to inconvenience ourselves a bit to ensure we have the water we need for survival in the future? Why or why not?
- While local governments may set water restrictions, why is it difficult it is to regulate what people do inside their homes?
- Your plan was to consider residential, commercial and industrial water users. Of these, who is likely using the most water and how should this affect a local government's conservation plan? (see the article "Duke Energy Faces Water Issues" to further explore this issue: http://www.newsobserver.com/print/tuesday/city_state/story/746074.html)



14. As homework, ask students to review their water tally sheet and to come up with ideas on ways they and their family members can cut down their water use (remind them to consider the differences in want and need and to also consider the amount of water used in all actions). Students should create a family action plan for conserving water (see the attached *Tips for Conserving our Water Supply* for examples.)

Culminating Activities

- Have students make posters or pamphlets on how to conserve water and/or the importance of conserving water in NC. Display these in the school and/or copy for community distribution as a means of conservation education.
- After completing their homework and noting ways their household can cut back water use, give students another copy of “How Much Water Does My Family Use” to again tally water use after implementing some conservation techniques. Have students compare/contrast water use pre and post conservation and evaluate the impact of their changes.
- Have students investigate how a local business, educational institution or manufacturing industry is conserving water (or not) in response to the current drought.

Multiple Intelligences Addressed

Linguistic

Logical-mathematical

Visual-spatial

Body-kinesthetic

Interpersonal

Intrapersonal

Naturalist



Name: _____

How Much Water Does My Family Use?

A: Water Used	B: Put a check mark in this column every time you or a household member did this	C: Total check marks for the day	D: Approximate Gallons Used	E: Total Gallons-Column C X D
Flushed toilet			6	
Filled the bathtub			70	
Took a shower (one check for each 5 minutes)			35	
Washed dishes by hand (water running)			30	
Washed dishes by hand (sink plugged, water off)			4	
Turned on the dishwasher			15	
Washed a small load of clothes			45	
Washed a large load of clothes			30	
Brushed teeth with water running			2	
Brushed teeth with water off in between			1	
Watered lawn (1 check for each 20 min.)			150	
Washed hands			1	
Drink water			0.25	
Wash car (water off while soaping)			40	
Wash car (water running the entire time)			180	
Left water dripping or leaky faucet			5	
Turned on faucet for any other use not listed (one check each minute)			4	

Total Gallons Used in 1 Day (add all numbers in Column E): _____

How many people live in your household? _____

Drought hammering N.C. farmers

U.S. House to hear of their plight

Oct. 23, 2007

Matthew Eisley, Staff Writer

JOHNSTON COUNTY - Congressman Bob Etheridge bent over a parched soybean field Monday, plucked one of farmer Jerry Jordan's withered stalks and cracked open a crunchy brown pod.

"This one's totally dry," he said, holding it up. "There's nothing in it." He pointed at another wispy stalk. "See that one? It's dead."

Etheridge surveyed nine acres of Jordan's agricultural agony, shook his head and declared: "This is pretty much pure drought."

For many Triangle residents, this year's unrelenting, record drought means sacrificing lush lawns and luxurious showers. For thousands of North Carolina farmers, it means financial losses, worries about next year and possible bankruptcy.

"It's a lot more severe than the average person knows," said Etheridge, a Lillington Democrat whose son still works a Harnett County family farm. "The people who provide the food and fiber for America are facing one of their toughest years in a long time."

Etheridge plans to highlight the plight of Tar Heel farmers Thursday at a hearing of the U.S. House Agriculture Committee. He and dozens of lawmakers from both parties are pushing to include drought-recovery farm grants in an Iraq war spending bill.

The prospects are uncertain. President Bush has said he'll veto anything that exceeds his request. And Congress has reinstated a rule requiring a way to pay for new spending.

But, as Etheridge noted, Congress has attached farm relief to military spending bills before.

It's defense, too

"Our food supply is part of our national defense," he said.

Members of Congress often go along with disaster relief elsewhere, because next year their voters might be the ones facing a drought, flood, hurricane, earthquake or other calamity.

Farmers face several kinds of peril. This year's cotton, corn, soybean, peanut and hay crops are coming up woefully short. The state is expected to produce almost 40 percent less in soybeans this year than last, and less than half as much cotton.



That means that even farmers with insurance will make much less money -- if they make any -- to spend on next year's crops.

A severe hay shortage is forcing livestock farmers to spend more on winter feed or sell their herds at depressed prices.

Some farmers switched this year from cotton to corn, hoping to cash in on the ethanol boom -- only to have the drought wipe out their crops.

"We cringe a little more each month, because it's going from bad to worse," said Brian Long, a spokesman for the state Department of Agriculture and Consumer Services.

The drought's economic effects threaten to reach far beyond farm families. Already, less produce and fewer varieties of it have been available at farmers markets. Higher grocery store prices could follow.

"It's the worst I've ever seen," said Don Nicholson, a state regional agronomist. "My mother's 76. She talks about how bad it was in the early '50s. That's the only reference point I have."

Jerry Jordan says he'll hang on. But he'd be surprised to break even this year as costs rise and his yields of soybeans, tobacco and sweet potatoes plummet.

"We'll try to pick 'em if it covers our fuel cost," he said. "If they don't turn out, I'll probably just quit on 'em. We need rain for next year's crops -- a lot of rain."

It's been so dry and hot this year that Jordan's irrigation ponds long ago went dry.

"You just don't have any options," he said. "You just sit there and watch it die."

Answer the following on notebook paper:

1. How is the drought affecting North Carolina farmers?
2. How does Congressman Etheridge plan to advocate for NC farms? Do you agree with his plan? Why or why not?
3. Beyond the negative impact on farm families and their income, what negative economic impacts might the drought result in?
4. How would you feel if you were Jerry Jordan?
5. In your opinion, can a severe water situation such as NC is currently experiencing be avoided or alleviated? Explain.
6. Whose responsibility is it to manage water use and availability?

Source: <http://www.newsobserver.com/weather/drought/story/746039.html>

Tips for Preserving Our Water Supply

Changing What You Use

- Replace shower heads and faucet aerators with water efficient models.
- Use a water-filled milk jug or plastic bottle in your toilet tank to displace water; this allows your toilet to operate using less water.
- Choose non-phosphate or low phosphate detergents. High phosphate levels in lakes and streams can kill fish and other wildlife.
- Use a broom instead of water to clean your driveway or garage . Do not sweep debris into the street or storm sewer.
- Put a spray nozzle on the end of your hose for car washing and plant watering to prevent the hose from continually releasing water and to control the amount of water used.
- Place containers outside to catch rain water for watering and outdoor washing.
- Use native plants in your garden that require less water.
- Use cat litter or sand instead of salt on icy walks. Salt pollutes water and kills plants.

Changing What You Do

- Do not let the water run while brushing your teeth or washing your face (you can save up to 5 gallons).
- Do not leave the water running if you wash dishes by hand.
- Rinse all your dishes at once by using a dish rack placed in the sink.
- Only run your dishwasher and washing machine when they are full.
- Take showers rather than baths and limit your time in the shower.
- Do not open fire hydrants on hot summer days because water needed to fight a fire will not be available in an emergency. Also, opening fire hydrants is illegal.
- Do not throw in the trash, pour down the drain, or dump on the ground paint, antifreeze, motor oil, and other household hazardous wastes, because they can contaminate groundwater and surface water.
- Dispose of tissues, dead insects, and other waste in a trash can rather than a toilet or a sink.
- Plant native plants instead of traditional lawn grass to avoid the use of herbicides, pesticides, fertilizers.
- Do not dump used motor oil on the ground or into storm drains; throwing motor oil in the trash is illegal.
- Recycling centers and many service stations accept used motor oil and other hazardous wastes for recycling and/or proper disposal.

Improving Your Housekeeping

- Fix leaks by replacing faucet washers and toilet flappers as needed. A slow drip or leak can easily waste more than 100 gallons of water a week, which leads to an unnecessarily high water bill.
- Put all litter in trash cans so it does not get washed into the storm drains.
- Clean up after your pets. In NC, pet waste should be picked up and placed in a sealed bag and disposed of in the trash or should be buried away from gardens, streams, ditches, lakes, or wells.

Educating Yourself and Others

- Educate your community about the effects of improper disposal of household waste, such as motor oil and pesticides. Storm drains should never be used as “trash cans” as storm water goes directly to lakes and rivers where it can impact aquatic life. For more information go to:
<http://www.nccwep.org/stormwater/index.php>
- Encourage your neighbors to conserve!

Source: www.epa.gov/reg5rcra/wptdiv/p2pages/water.pdf



